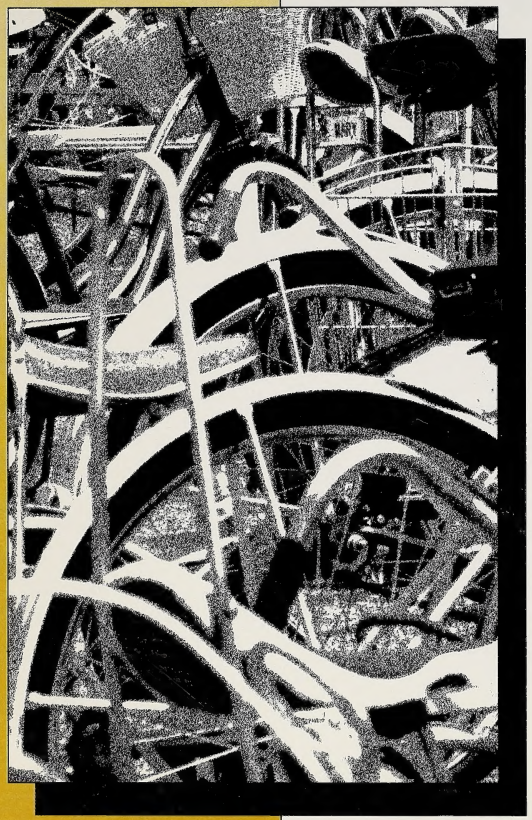
MATHEMATICS



8

MODULE 5

RATIO AND PROPORTION

Distance Learning

Alberta EDUCATION

LEARNING FACILITATOR'S MANUAL

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Mathematics 8

Module 5: Ratio and Proportion

LEARNING FACILITATOR'S MANUAL

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Student's should not have access to these assignments or the final test until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

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Learning Facilitator's Manual
Module 5
Ratio and Proportion
Alberta Distance Learning Centre
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MODULE INTRODUCTION

What Lies Ahead

In this section the student will preview the module and learn how the module will be evaluated.

Gathering Materials

For this section the student will need these items

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students that the goal of the Module Introduction is to preview the module.
- Discuss with the students the learning process, time management, and evaluation.

The Learning Process

Each section of Module 5 deals with a different skill involving whole numbers or integers.

Sections have several activities.

- Introductory Activities
- Practice Activities
- Extra Practice
- Concluding Activities

Remind the students that they will not be expected to do all the activities. You will help them decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 3 weeks in a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Discuss the evaluation of Module 5 with the students.

GETTING SET

What Lies Ahead

This section will test these skills.

- writing a ratio using the colon form, fraction form, and decimal number form
- writing equivalent ratios
- writing ratios in simplest form
- comparing and ordering ratios
- solving ratio problems using proportions

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of Section 1 is to determine the students strengths and weaknesses.
- Help the students check their answers to the pretest. It is not necessary to correct any errors at this time.
- See the end of the section for further directions.

Pretest

1.

   a. Write the ratio of the number of nickels to the number of pennies. Use the colon form.

   b. Write the ratio of the value in cents of the nickels to the value in cents of the pennies. Use the fraction form.

   c. Write the ratio of the value in cents of the nickels to the total value in cents. Use the decimal number form.

Suggested Answers

1. a. 3 : 5

   b. $\frac{15}{5}$

   c. 0.75

2. Write three equivalent ratios for each of the following.

   a. 2 out of 3 people voted for Edith Jones.

   b. At the County Fair, 20 student tickets were sold for every 5 adult tickets sold.

2.

   a. 2 : 3, 4 : 6, 6 : 9, 8 : 12, ...

   b. $\frac{20}{5}, \frac{40}{10}, \frac{60}{15}, \frac{80}{20}, \ldots$

3. A baseball team won 36 out of 42 games during the season. It won 8 out of 11 games during the playoffs. Was the ratio of the number of games won to the number of games played better during the season or during the playoffs?

3. $\frac{36}{42} > \frac{8}{11}$

The ratio of games won to games played was better during the season.

4. Matt sank 20 basketballs in 36 shots. Jon sank 10 basketballs in 18 shots. Are these ratios proportional?

4. $\frac{20}{36} = \frac{10}{18}$

These ratios are proportional.

5. In Tara's class the ratio of the number of girls to the number of boys is 3 to 4. There are 12 girls in the class. How many boys are there in the class?

5. $\frac{3}{4} = \frac{12}{b}$

$b = 16$

There are 16 boys in Tara's class.

6. The ratio of the measure of uncooked macaroni to the measure of cooked macaroni is 1 to 3. How much cooked macaroni is made from 350 mL of uncooked macaroni?

6. $\frac{1}{3} = \frac{350}{m}$

$m = 1050$

1050 mL of cooked macaroni is made from 350 mL of uncooked macaroni.

Guiding the Student

Help the students to decide what to do next. It is recommended that students review the notes in sections which correspond to the questions in the pretest with which the students experienced success, and that the students do a few sample questions from the activities.

It is recommended that students carefully study the notes in the sections which correspond to questions in the pretest with which the students experienced difficulty, and that the students do most of the questions in the activities.

Question	Skill	Section
1	reading and writing ratios	2
2	finding equivalent ratios	3
3, 4	comparing and odering ratios	4
5, 6	using ratios to solve problems	5

READING AND WRITING RATIOS

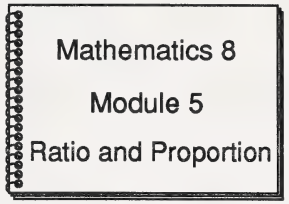
What Lies Ahead

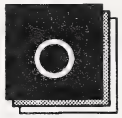
In this section the student will review these skills.

- reading a ratio
- interpreting a ratio
- writing a ratio using a colon
- writing a ratio using its fraction form
- writing a ratio using its decimal number form

Gathering Materials

For this section the student needs these items.





(optional)

Ratio and Percent from *Computer Drill and Instruction: Mathematics, Level D* (SRA)

- The student will also require the hexagons, triangles, and parallelograms which are found in the Appendix.

Guiding the Student

- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

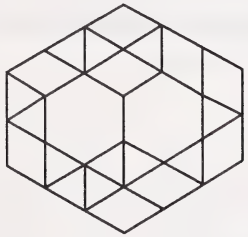
Introductory Activities

For Questions 1 to 3 you will require hexagons, triangles, and parallelograms. These shapes can be cut out of the Appendix at the back of the book.

Arrange the shapes in the patterns shown in Figure 1 and Figure 2.

Figure 1

Figure 2



1. Compare the number of hexagons in Figure 1 to the number of parallelograms in Figure 1.

   a. The number of hexagons in Figure 1 is ▒ .

   b. The number of parallelograms in Figure 1 is ▒ .

   c. The ratio of the number of hexagons in Figure 1 to the number of parallelograms in Figure 1 is ▒ to ▒ .

Suggested Answers

1. a. 1

   b. 6

   c. 1 to 6

2. Compare the number of triangles in Figure 1 to the number of parallelograms in Figure 2.

   a. The number of triangles in Figure 1 is ▒.

   b. The number of parallelograms in Figure 2 is ▒.

   c. The ratio of the number of triangles in Figure 1 to the number of parallelograms in Figure 2 is ▒ to ▒.

3. Compare the number of triangles in Figure 2 to the total number of triangles used for both figures.

   a. The number of triangles in Figure 2 is ▒.

   b. The total number of triangles for both figures is ▒.

   c. The ratio of the number of triangles in Figure 2 to the total number of triangles for both figures is ▒ to ▒.

2. a. 6

   b. 9

   c. 6 to 9

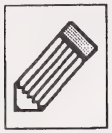
3. a. 12

   b. 18

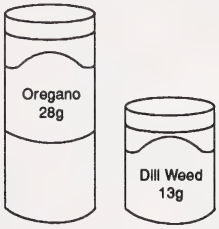
   c. 12 to 18

Practice Activities

Print Alternative



1. Write statements comparing the capacities of these spice bottles. Use the ratios that follow.



   a. 28 to 13

   b. 13 to 41

   c. 28 to 41

2. There are 6 balls in a group of 10 items of sports equipment. What is the ratio of the number of balls to the total number of equipment items? Use the fraction form.

Suggested Answers

1. a. The ratio of the amount of oregano to the amount of dill weed is 28 to 13.

   b. The ratio of the amount of dill weed to the total amount of spice is 13 to 41.

   c. The ratio of the amount of oregano to the total amount of spice is 28 to 41.

2. $\frac{6}{10}$ (or $\frac{3}{5}$)

   Students are not expected to write the ratio in lowest terms here. However, some students may do so.

3. There are 5 roses and 8 daisies in a bouquet of flowers. Use the fraction form to write the following ratios.

   a. the number of roses to the number of daisies

   b. the number of roses to the total number of flowers

3. a. $\frac{5}{8}$

   b. $\frac{5}{13}$

4. The Hawks hockey team won 41 games, lost 10 games, and tied 29 games. Use the colon form to write the win-loss ratio.

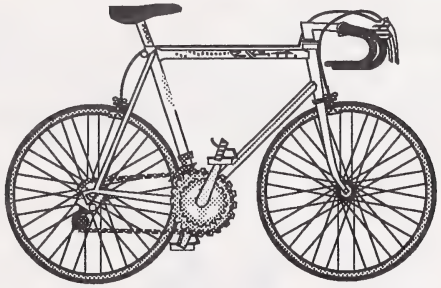
4. 41 : 10

5. Buns come in packages of 8. Wieners come in packages of 12. Use the colon form to write the ratio of the number of wieners to the number of buns.

5. 8 : 12 (or 2 : 3)

   Students are not expected to write ratios in lowest terms, but some students may do so.

6. A five-speed bicycle has the gear ratios shown in the table at the right. Complete the table by expressing the gear ratios in decimal number form rounded to the nearest thousandth.



7. There are 128 students and 5 teachers in a school. Write the student-teacher ratio. Use the decimal number form rounded to the nearest tenth.

6.

Teeth on the Front Gear	Teeth on the Back Gear	Gear Ratio
40	28	1.429
40	24	1.667
40	20	2.000
40	17	2.353
40	14	2.857

7. $\frac{128}{5} = 25.6$

The student-teacher ratio is 25.6.

Computer Alternative

8. Do Lessons 1 to 5 of the disk *Ratio and Percent* from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

   Read the instructions in the folder with the disk before using the program. Remember, if you need help, press the SHIFT key and the [?] key.

8. Computer corrected

Concluding Activities

1. Jill is mixing different colours of paint to create a shade of brown. To make this shade, she mixes 8 parts of red paint, 5 parts of yellow paint, and 1 part of black paint.

   a. What is the ratio of the quantity of red to yellow to black?

   b. What is the ratio of the quantity of black to red to yellow?

   c. What is the ratio of the quantity of yellow to red to black?

   d. What is the ratio of the quantity of red to brown?

   e. What is the ratio of the quantity of yellow to brown?

   f. What is the ratio of the quantity of black to brown?

Suggested Answers

1. a. 8 : 5 : 1

   b. 1 : 8 : 5

   c. 5 : 8 : 1

   d. 8 : 14 (or 4 : 7)

      Students are not expected to express the ratio in lowest terms, but students may do so.

   e. 5 : 14

   f. 1 : 14

2. Sam is 12 years old, Sandra is 13 years old, and Stella is 15 years old.

   a. What is the ratio of Sam's age to Sandra's age to Stella's age?

   b. What is the ratio of Stella's age to Sandra's age to Sam's age?

   c. What is the ratio of Sam's age to the total age of all three children?

   d. What is the ratio of the sum of Sandra's age and Sam's age to the total age of all three children?

   e. What is the ratio of Stella's age to the total age of all three children?

2. a. 12 : 13 : 15

   b. 15 : 13 : 12

   c. 12 : 40 (or 3 : 10)

   d. 25 : 40 (or 5 : 8)

   e. 15 : 40 (or 3 : 8)

Note:

Students are not expected to express answers in lowest terms here, but some students may do so.

FINDING EQUIVALENT RATIOS

What Lies Ahead

In this section the student will learn these skills.

- finding equivalent ratios
- writing ratios in lowest terms

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 5
Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students check the answers to the activities in this section and correct any errors.

Introductory Activities

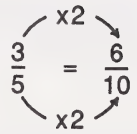
1. Use diagrams and multiplication to write an equivalent ratio for each of the following ratios.

   a. The ratio of the number of boxes to the number of bags is 3 to 5.

   b. The ratio of the number of squares to the number of circles is 7 to 5.

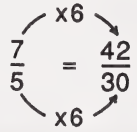
Suggested Answers

1. a. Answers will vary.
   Example:



   $\frac{6}{10}$ is an equivalent ratio for $\frac{3}{5}$.

   b. Answers will vary.
   Example:



   $\frac{42}{30}$ is an equivalent ratio for $\frac{7}{5}$.

2. Use diagrams and division to express each of the following ratios in lowest terms.

   a. The ratio of the number of cars to the number of bicycles is 8 to 12.

   b. The ratio of the number of dogs to the number of cats is 5 to 10.

2. a. $\frac{8}{12} \overset{\div 4}{=} \frac{2}{3}$

$\frac{8}{12}$ expressed in lowest terms is $\frac{2}{3}$.

b. $\frac{5}{10} \overset{\div 5}{=} \frac{1}{2}$

$\frac{5}{10}$ expressed in lowest terms is $\frac{1}{2}$.

Practice Activities

1. The body of an adult contains about 4.7 L of blood. A blood donor usually gives 0.470 L of blood. What is the ratio of the quantity of the donated blood to the quantity of blood in the body? Express the ratio in lowest terms.

2. In one day a man inhales 11.4 cm^3 of air. About 0.57 cm^3 of oxygen in this air is absorbed into the bloodstream. What is the ratio of the volume of air inhaled to the volume of oxygen absorbed? Express the ratio in lowest terms.

Suggested Answers

1. $$\frac{0.470}{4.7} = \frac{0.47}{4.7} \overset{\times 100}{=} \frac{47}{470} = \frac{1}{10}$$

The rate of the quantity of the donated blood to the quantity of blood in the body expressed in lowest terms is $\frac{1}{10}$.

2. $$\frac{11.4}{0.57} \overset{\times 100}{=} \frac{1140}{57} = \frac{20}{1}$$

The ratio of the volume of air inhaled to the volume of oxygen absorbed in lowest terms is $\frac{20}{1}$.

3. A Minute Beetle is 0.02 cm long. A Goliath Beetle is 14.86 cm long. What is the ratio of the length of the Minute Beetle to the length of the Goliath Beetle? Express the ratio in lowest terms.

4. Jackson slept for $6\frac{1}{2}$ hours on Monday night and $7\frac{1}{3}$ hours on Tuesday night. What is the ratio of the time he slept on Monday night to the time he slept on Tuesday night? Express the ratio in lowest terms.

3. $\frac{0.02}{14.86} \overset{\times 100}{=} \frac{2}{1486} = \frac{1}{743}$

The ratio of the length of the Minute Beetle to the length of the Goliath Beetle expressed in lowest terms is $\frac{1}{743}$.

4. $6\frac{1}{2} : 7\frac{1}{3} = \frac{13}{2} : \frac{22}{3}$

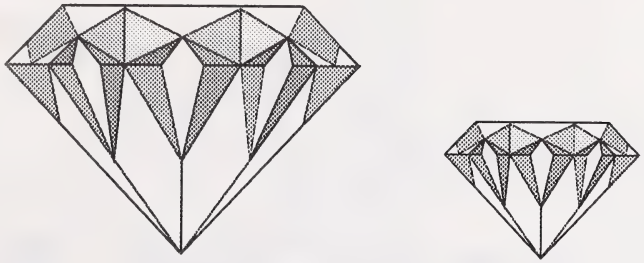
$= \frac{39}{6} : \frac{44}{6}$

$= \frac{39}{6} \times 6 : \frac{44}{6} \times 6$

$= 39 : 44$

The ratio of the time that Jackson slept on Monday night to the time he slept on Tuesday night in lowest terms is 39 : 44.

5. The largest blue diamond in the world is the Hope Diamond which weighs $44\frac{2}{5}$ carats. Another famous diamond, the Timkin Stone, weighs $28\frac{3}{4}$ carats. What is the ratio of the weight of the Hope Diamond to the weight of the Timkin Stone? Express the ratio in lowest terms.



5. $44\frac{2}{5} : 28\frac{3}{4} = \frac{222}{5} : \frac{115}{4}$

$= \frac{888}{20} : \frac{575}{20}$

$= \frac{888}{20} \times 20 : \frac{575}{20} \times 20$

$= 888 : 575$

The ratio of the weight of the Hope Diamond to the weight of the Timkin Stone is 888 : 575.

Concluding Activities

1. At the 1988 Winter Olympics in Calgary, West Germany won 2 gold medals, 4 silver medals, and 2 bronze medals. Switzerland won 5 gold medals, 5 silver medals, and 5 bronze medals.

   a. What is the ratio of the number of gold medals to silver medals to bronze medals won by West Germany? Express the ratio in lowest terms.

   b. What is the ratio of the number of gold medals to silver medals to bronze medals won by Switzerland? Express the ratio in lowest terms.

   c. What do you think is a disadvantage of expressing ratios in lowest terms?

Suggested Answers

1. a. $2 : 4 : 2 = 1 : 2 : 1$

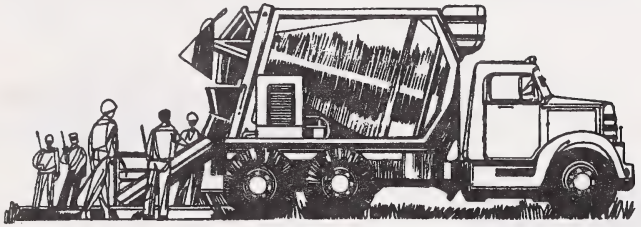
   The GCF of 2, 4, and 2 is 2, so divide by 2 to get the lowest terms.

   b. $5 : 5 : 5 = 1 : 1 : 1$

   The GCF of 5 is 5, so divide by 5 to get the lowest terms.

   c. When ratios are expressed in lowest terms, you do not know the actual numbers involved in the ratio.

2. To make a cement foundation, 300 kg of gravel are mixed with 450 kg of sand and 100 kg of cement. What is the ratio of gravel to sand to cement? Express the ratio in lowest terms.



3. During a hockey season a team had 36 wins, 24 losses, and 8 ties. What is the ratio of wins to losses to ties? Express the ratio in lowest terms.

2. $300 : 450 : 100 = 6 : 9 : 2$

The GCF of 300, 450, and 100 is 50, so divide by 50 to get the lowest terms.

3. $36 : 24 : 8 = 9 : 6 : 2$

The GCF of 36, 24, and 8 is 4, so divide by 4 to get the lowest terms.

4. Mars is $\frac{1}{7}$ of the earth's size. Mercury is $\frac{1}{16}$ of the earth's size. What is the ratio of the size of Earth to the size of Mars to the size of Mercury? Express the ratio in lowest terms.

5. Saturn is 730 times the size of Venus. Neptune is about $\frac{1}{12}$ of the size of Saturn. What is the ratio of the size of Venus to the size of Saturn to the size of Neptune? Express the ratio in lowest terms.

4. $1 : \frac{1}{7} : \frac{1}{16} = \frac{112}{112} : \frac{16}{112} : \frac{7}{112}$

$= 112 : 16 : 7$

The ratio of the size of Earth to the size of Mars to the size of Mercury is 112 : 16 : 7.

5. $1 : 730 : \frac{730}{12} = \frac{12}{12} : \frac{8760}{12} : \frac{730}{12}$

GCF = 2

$= 12 : 8760 : 730$

$= 6 : 4380 : 345$

The ratio of the size of Venus to the size of Saturn to the size of Neptune is 6 : 4380 : 345.

COMPARING AND ORDERING RATIOS

What Lies Ahead

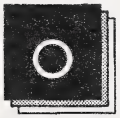
In this section the student will learn these skills.

- comparing ratios
- ordering ratios from largest to smallest or from smallest to largest
- determining if situations are proportional

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 5
Ratio and Proportion



(optional)

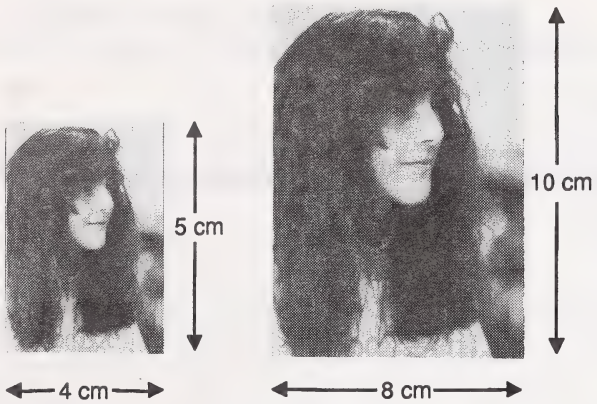
Ratio and Percent from *Computer Drill and Instruction: Mathematics, Level D* (SRA)

Guiding the Student

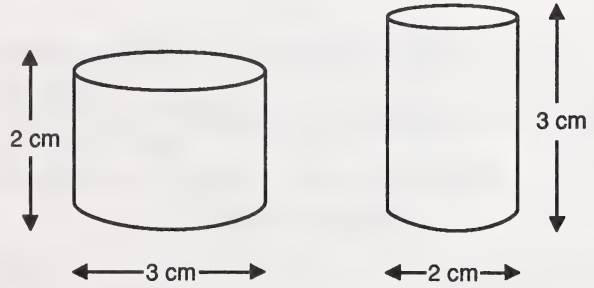
- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Look at the photographs. Compare the ratios of the lengths to the widths. Are they equivalent?



2. Look at these cylinders. Compare the ratios of the heights to the diameters. Are they equivalent?



Suggested Answers

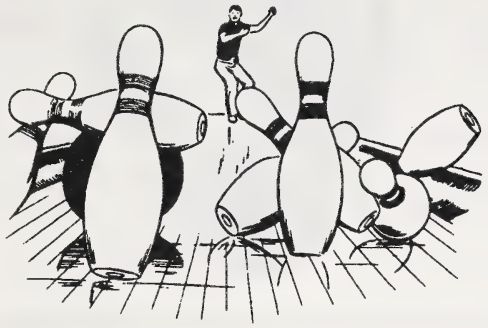
1. $\frac{5}{4} = \frac{10}{8}$

   The ratios of the lengths to the widths are equivalent.

2. $\frac{2}{3} < \frac{3}{2}$

   The ratios of the heights to the diameters are not equivalent.

3. Last year a bowling team won 90 out of 162 games. So far this year they have won 10 out of 12 games. Is the team doing better or worse than it did last year?



4. In four games a basketball player made 7 out of 10 shots, 12 out of 20 shots, 3 out of 5 shots, and 3 out of 4 shots.

   a. In which game did the player have the greatest success?

   b. In which game did the player have the least success?

   c. In which games did the player have the same amount of success?

3. $\frac{90}{162} < \frac{10}{12} = \frac{10}{18} < \frac{10}{12}$

   The team is doing better than it did last year.

4. a. $\frac{7}{10} > \frac{12}{20} = \frac{3}{5} < \frac{3}{4}$

   The player had the greatest success in the game where he made 3 out of 4 shots.

   b. The player had the least success in the games in which he made 12 out of 20 shots and 3 out of 5 shots.

   c. The player had the same amount of success in the games where he made 12 out of 20 shots and 3 out of 5 shots.

5. Matt and Jon play wheelchair basketball. Matt sank 6 out of 9 basketball shots. Jon sank 9 out of 15. Which of these two players is the more accurate shooter?

6. Kara scored 17 out of 25 on the first test and 14 out of 20 on the second test. On which test did she do better?

5. $\frac{6}{9} > \frac{9}{15} = \frac{2}{3} > \frac{3}{5}$

Matt is the more accurate shooter.

6. $\frac{17}{25} < \frac{14}{20} = \frac{17}{25} < \frac{7}{10}$

Kara did better on the second test.

Computer Alternative

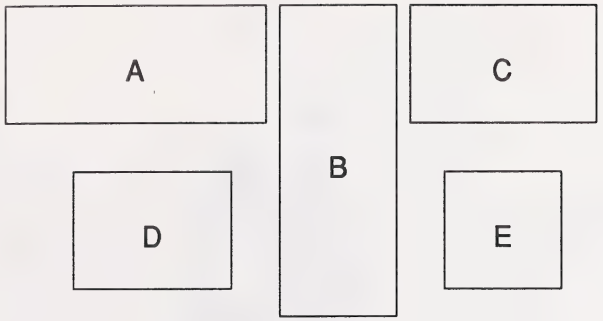
7. Do Lesson 7 of the disk *Ratio and Percent* from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA). Read the instructions in the folder with the disk before using the program.

   Remember, if you need help, press the SHIFT key and the [?] key.

7. Computer corrected

Practice Activities

1. Consider the following rectangles.



   a. Which of these appeals most to your eye?

   b. Measure the length and width of each rectangle. Use your calculator to find the ratio of length to width for each. Give each ratio in its decimal number form rounded to the nearest tenth.

   c. The ancient Greeks felt that the rectangles that were most appealing to the eye were those with ratios of length to width of 1.618. They called this the **golden ratio**. They used rectangles with this ratio in many of their buildings.

      Are any of the ratios in Part b. of this question close to the golden ratio? If so, which ones?

Suggested Answers

1. a. Answers will vary. This is a matter of personal preference. However, generally students pick C.

   b. A $\frac{4}{1.8} = 2.2$

      B $\frac{1.8}{4.9} = 0.4$

      C $\frac{2.9}{1.8} = 1.6$

      D $\frac{2.5}{1.9} = 1.3$

      E $\frac{1.8}{1.8} = 1.0$

   c. Rectangle C is close to the golden ratio.

2. a. Recruit three friends and measure their heights from the floor to their shoulders. Then measure the heights of their heads from their chins to the tops of their heads. Use these measurements to find the ratio of the height of the body to the height of the head.

   b. What do you notice about the ratios in Part a.?

   c. Examine the cartoon character below. What do you notice?

2. a.

	Person 1	Person 2	Person 3
Height of Body			
Height of Head			
Ratio of Height of Body to Height of Head			

Answers will vary.

b. Answers will vary, but at age 9 the ratio of height of body to height of head is usually 6 to 1, in adults the ratio is usually 7.5 to 1. So, the ratio will probably be about 7 to 1.

c. The character's head is the same size as his body. It is not in proportion.

USING PROPORTIONS TO SOLVE RATIO PROBLEMS

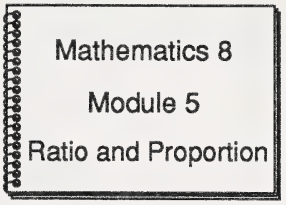
What Lies Ahead

In this section the student will learn these skills.

- writing a proportion
- finding the missing term of a proportion

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students to check their answers to the activities in this section and correct any errors.

Practice Activities

1. The ratio of the weight of an object on the moon to the weight of an object on Earth is 1 to 6. What is the moon weight of these objects that have been weighed on Earth?

   a. a 42-kg boy

   b. a 3-kg cat

   c. a 0.05-kg mouse

2. The moon pulls objects towards it with a different amount of force than the earth does. It is easier to jump away from the surface of the moon than it is to jump away from the surface of the earth. The ratio of a person's jump on Earth to a person's jump on the moon is 1 to 6.

   a. If a high jumper can jump 2.25 m on Earth, how high would the jump be on the moon?

   b. If a pole jumper can jump 5.5 m on Earth, how high would the jump be on the moon?

Suggested Answers

1. a. $\frac{1}{6} = \frac{n}{42}$

   $n = \frac{1}{42}$

   A 42-kg boy would weigh 7 kg on the moon.

   b. $\frac{1}{6} = \frac{n}{3}$

   $n = 0.5$

   A 3-kg cat would weigh 0.5 kg on the moon.

   c. $\frac{1}{6} = \frac{n}{0.05}$

   $n = 0.008$

   A 0.05-kg mouse would weigh 0.008 kg on the moon.

2. a. $\frac{1}{6} = \frac{2.25}{n}$

   $n = 13.5$

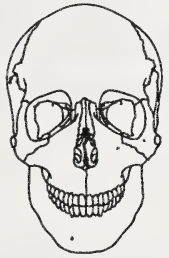
   A high jumper could jump 13.5 m on the moon.

   b. $\frac{1}{6} = \frac{5.5}{n}$

   $n = 33$

   A high jumper could jump 33 m on the moon.

3. Your body contains 206 bones. The ratio of the number of bones in your head to the total number of bones in your body is about 1 to 7. About how many bones are there in your head?

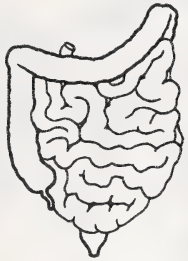


3. $\frac{1}{7} \doteq \frac{n}{206}$

$n \doteq 30$

There are about 30 bones in your head.

4. The ratio of the length of your small intestine to the total length of both your large and small intestine is 4 : 5. If your large and small intestines are about 7.6 m long in total, how long is your small intestine?



4. $\frac{4}{5} \doteq \frac{n}{7.6}$

$n \doteq 6$

Your small intestine is about 6 m long.

Concluding Activities

1. Three partners invest in a company in the ratio of 5 : 4 : 1. If they divide their profits of $150 000 in the same ratio as they invested, how much does each partner receive?

2. The ratio of the number of red marbles to blue marbles to white marbles is 5 : 12 : 8. If there are 100 marbles in the bag, how many marbles of each colour are there?

Suggested Answers

1. $5 + 4 + 1 = 10$

$\frac{5}{10} = \frac{a}{150\,000}$ $\frac{4}{10} = \frac{b}{150\,000}$ $\frac{1}{10} = \frac{c}{150\,000}$

$\frac{1}{2} = \frac{a}{150\,000}$ $\frac{2}{5} = \frac{b}{150\,000}$ $c = 15\,000$

$a = 75\,000$ $b = 60\,000$

So, one partner receives $75 000, another partner receives $60 000, and the last partner receives $15 000.

2. $5 + 12 + 8 = 25$

$\frac{5}{25} = \frac{r}{100}$ $\frac{12}{25} = \frac{b}{100}$ $\frac{8}{25} = \frac{w}{100}$

$\frac{1}{5} = \frac{r}{100}$ $b = 48$ $w = 32$

$r = 20$

There are 20 red marbles, 48 blue marbles, and 32 white marbles.

SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Sections 1 to 5.

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section is to review Part One.
- Help the students check their answers to the activities in the pretest in Section 1 and correct any errors. (See Section 1 for answers).

GETTING SET

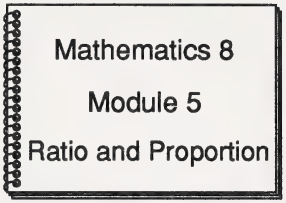
What Lies Ahead

This section will test the knowledge of these skills.

- writing rates using the colon and the fraction form
- simplifying rates
- solving rate problems using proportions

Gathering Materials

For this section the student needs these skills.



Guiding the Student

- Emphasize to the students the goal of this section is to determine their strengths and weaknesses.
- Help the students check their answers to the pretest. It is not necessary to correct errors. See the last page of this section for further directions.

Pretest

1. a. Raja can type 99 words in 4 minutes. Express this as a rate. Use the colon form.

b. Shawn sold 39 tires in 7 hours. Express this as a rate. Use the fraction form.

Suggested Answers

1. a. 99 words : 4 minutes

b. $\frac{39 \text{ tires}}{7 \text{ hours}}$

2. It rained 42 mm in 10 h. What is the rate of rainfall in simplest form?

2. 42 mm/10 h

$$\frac{42\ \text{mm} \div 10}{10\ \text{h} \div 10} = \frac{4.2\ \text{mm}}{1\ \text{h}}$$

The rate of rainfall is 4.2 mm/h.

3. Francena bought 9 oranges. If the selling price of the oranges is 12 for $3.99, what did Francena pay?

3. $3.99/12 oranges

$$\frac{\$3.99 \div 12}{12 \text{ oranges} \div 12} = \$0.33/\text{orange}$$

One orange costs $0.33.

So, $9 \times 0.33 = 2.99$.

Nine oranges cost $2.99.

Francena paid $2.99 for 9 oranges.

Guiding the Student

Help the students to decide what to do next. It is recommended that students review the notes in the sections which correspond to the questions in the pretest with which the students experienced success, and that the students do a few sample questions from the activities.

It is recommended that students carefully study the notes in the sections which correspond to questions in the pretest with which the students experienced difficulty, and that the students do most of the questions in the activities.

Question	Skill	Section
1	reading and writing rates	8
2	finding equivalent rates	8
3	using proportions to solve problems	9

RATES

What Lies Ahead

In this section the student will learn these skills.

- reading and writing rates
- simplifying rates

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section and help the student decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Write rates to describe the following situations. Use the colon form.

   a. A child buys 2 apples for $0.80.

   b. A typist types 700 words in 8 minutes.

   c. A metal expands 12.7 cm as the temperature rises 18° C.

   d. A spring stretches 10.5 cm when a 150-g mass is hung on it.

   e. A person breathes 1500 times in 24 hours.

2. Write ratios to describe the statements in Question 1. Use the fraction form.

Suggested Answers

1. a. 2 apples : $0.80

   b. 700 words : 8 minutes

   c. 12.7 cm : 18°C

   d. 10.5 cm : 150 g

   e. 1500 breaths : 24 hours

2. a. $\frac{2}{0.80}$

   b. $\frac{700}{8}$

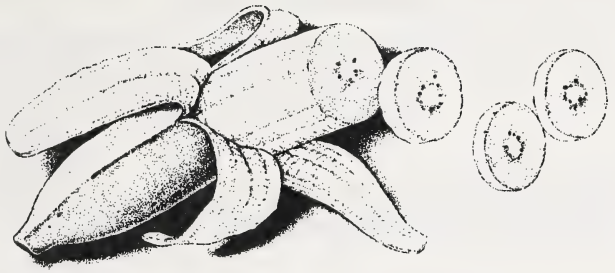
   c. $\frac{12.7}{18}$

   d. $\frac{10.5}{150}$

   e. $\frac{1500}{24}$

Practice Activities

1. Which is the better buy, 5 kg of bananas for $7.35 or 3 kg of bananas for $4.45?



2. Dino travelled 830 km in 9 h. Frank travelled 640 km in 7 h. Who travelled at a faster rate of speed?

3. An athlete runs 100 m in 9.9 seconds. Another athlete runs 200 m in 19.8 seconds. Which athlete runs faster?

Suggested Answers

1. $7.35/5 kg $4.45/3 kg

$\frac{\$7.35 \div 5}{5\ kg \div 5} = \frac{\$1.47}{1\ kg}$ $\frac{\$4.45 \div 3}{3\ kg \div 3} = \frac{\$1.48}{1\ kg}$

5 kg of bananas for $7.35 is the better buy.

2. 830 km/9 h 640 km/7 h

$\frac{830\ km \div 9}{9\ h \div 9} = \frac{92\ km}{1\ h}$ $\frac{640\ km \div 7}{7\ h \div 7} = \frac{91\ km}{1\ h}$

Dino travelled at a faster rate of speed.

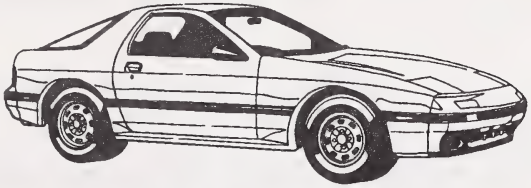
3. 9.9 s/100 m 19.8 s/200 m

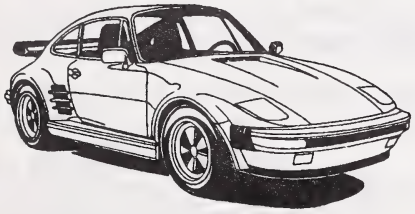
$\frac{9.9\ s \div 100}{100\ m \div 100} = \frac{0.099\ s}{1\ m}$ $\frac{19.8\ s \div 200}{200\ m \div 200} = \frac{0.099\ s}{1\ m}$

Both athletes run at the same speed.

Concluding Activities

1. Manuel's car travels 800 km on 72 L of gas. Ria's car travels 350 km on 33 L of gas. Who gets the better rate of gasoline consumption? Express the rates as L/100 km.





2. A 750-mL bottle of pop sells for $1.29. A 2-L bottle of pop sells for $3.05. Which is the better buy? Express the rates as $/100 mL.
(Hint: 1 L = 1000 mL)

Suggested Answers

1. 72 L /800 km 33 L /350 km

$$\frac{72\text{ L} \div 8}{800\text{ km} \div 8} = \frac{9\text{ L}}{100\text{ km}} \qquad \frac{33\text{ L} \div 3.5}{350\text{ km} \div 3.5} = \frac{9.4\text{ L}}{100\text{ km}}$$

Manuel gets the better rate of gas consumption.

2. $1.29/750 mL $3.05/2000 mL

$$\frac{\$1.29 \div 7.5}{750\text{ mL} \div 7.5} = \frac{\$0.17}{100\text{ mL}} \qquad \frac{\$3.05 \div 20}{2000\text{ mL} \div 20} = \frac{\$0.15}{100\text{ mL}}$$

The 2-L bottle for $3.05 is the better deal.

USING PROPORTIONS TO SOLVE RATE PROBLEMS

What Lies Ahead

In this section the student will learn these skills.

- writing a proportion involving rates
- solving rate problems using proportions

Gathering Materials

For this section students need these items.

Mathematics 8
Module 5
Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of the section and help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Practice Activities

1. Arthur, in training for a 10-km race, jogs 6 km daily. It takes him an average of 30 minutes to jog this distance.

   a. Write the rate that represents Arthur's training rate.

   b. At this rate, how long will it take him to finish the 10-km race? Write the proportion and solve.

   c. How far can he jog in 45 minutes?

2. Complete the following table.

Kilograms of Meat	2	4		9.5
Cost in Dollars	8.60		43.00	

3. If 8 pairs of socks sell for $10.99, what do 10 pairs cost?

4. At a rate of 2.5 m/s, how far can Arlene swim in 50 s?

Suggested Answers

1. a. 6 km/30 min or 1 km/5 min

   b. $\frac{1 \text{ km}}{5 \text{ min}} = \frac{10 \text{ km}}{\blacksquare}$

   $\frac{1}{5} \xrightarrow{\times 10} \frac{10}{\boxed{50}}$

   It would take 50 minutes to run 10 km.

   c. $\frac{1}{5} = \frac{\blacksquare}{45}$

   $\blacksquare = 9$

   Arthur could jog 9 km in 45 minutes.

2.

Kilograms of Meat	2	4	10	9.5
Cost in Dollars	8.60	17.20	43.00	40.85

3. $\frac{8}{10.99} = \frac{10}{\blacksquare}$ $\blacksquare = 13.74$

   10 pairs of socks cost $13.74

4. $\frac{2.5 \text{ m}}{1 \text{ s}} = \frac{\blacksquare}{50 \text{ s}}$ $\blacksquare = 125 \text{ m}$

   In 50 s Arlene can swim 125 m.

Extra Practice

1. The human heart beats an average of 72 times per minute. At this rate, how many heartbeats are there in the following time periods?

   a. 5 min

   b. 30 min

   c. 45 min

2. The table below lists the cruising speeds of three planes.

Type of Plane	Cruising Speed (km/h)
DC-9	826
747	893
L-1011	882

   For each plane, determine how far it can travel in 3 h.

Suggested Answers

1. a. 360 heartbeats/5 min

   b. 2160 heartbeats/30 min

   c. 3240 heartbeats/45 min

2. The DC-9 can travel 2478 km in 3 h.

   The 747 can travel 2679 km in 3 h.

   The L-1011 can travel 2646 km in 3 h.

3. René, who works a 40-h week, is paid $450 per week. At the same hourly wage, how much will she receive if she works a 36-h week?

3. $\frac{\$450}{40\ h} = \frac{\square}{36\ h}$

$\square = \$405$

René will receive $405 if she works a 36-h week.

Concluding Activities

1. Geoff can run at 10 m/s. The world's fastest human can run at 7.5 m/s. If Geoff had a head start of 30 m, would he win a 100-m race?

2. A swimmer's best record for the 100-m freestyle is 51.2 seconds. Her best record for the 200-m freestyle is 1 minute 52.8 seconds. If she could swim the 200-m race at the same rate as the 100-m race, how much time would she cut from her record?

Suggested Answers

1. $\frac{10\text{ m}}{1\text{ s}} = \frac{70\text{ m}}{\blacksquare}$ $\qquad$ $\frac{7.5\text{ m}}{1\text{ s}} = \frac{100\text{ m}}{\blacksquare}$

   $\blacksquare = 7\text{ s}$ $\qquad$ $\blacksquare = 13\text{ s}$

   Geoff would win a 100-m race if he had a 30-m head start.

2. $\frac{51.2\text{ s}}{100\text{ m}} = \frac{0.512\text{ s}}{1\text{ m}}$

   The swimmer's best record for the 100-m freestyle is 0.512 s/m.

   $\frac{0.512\text{ s}}{1\text{ m}} = \frac{\blacksquare}{200\text{ m}}$

   $\blacksquare = 102.4\text{ s}$
   $= 1\text{ minute } 42.4\text{ seconds}$

   If the swimmer could swim the 200-m freestyle event at the same rate of speed as the 100-m freestyle event, she would swim the 200 m in 1 minute 42.4 seconds.

   $$\begin{array}{r} 1\text{ minute } 52.8\text{ seconds} \\ -\ 1\text{ minute } 42.4\text{ seconds} \\ \hline 10.4\text{ seconds} \end{array}$$

   If the swimmer could swim at this rate, she would cut 10.4 seconds from her record.

SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Sections 7 to 9.

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section is to review Part Two.
- Help the students check their answers to the pretest and correct any errors. (See Section 7 for answers.)

GETTING SET

What Lies Ahead

This section will test the knowledge of these skills.

- interpreting percents less than 100%
- interpreting percents greater than 100%
- expressing a percent as a decimal number and a fraction
- expressing a decimal number and a fraction as a percent
- using proportions to solve problems of this form: what percent is a of b ?
- finding a percent of a number
- finding percent increase and decreases

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section is to determine their strengths and weaknesses.
- Help the students check their answers to the pretest. It is not necessary to correct errors. See the last page of this section for further directions.

Pretest

1. In a package of 100 gummed stars there are 28 blue, 13 gold, 23 green, and 15 silver stars. The rest are red.

   a. Express the number of stars of each colour as a percent of the total.

   b. Express the number of green stars as a percent of the gold stars.

   c. Express the number of blue stars as a percent of the silver stars.

Suggested Answers

1. a. 28% of the stars are blue.
   13% of the stars are gold.
   23% of the stars are green.
   15% of the stars are silver.

   b. The green stars are about 177% of the gold stars.

   c. The blue stars are about 187% of the silver stars.

Note:

In Grade 8 students are limited to work with percents that are whole numbers; so an estimate should be found for 1b. and 1c.

3. There are 9 eggs in a carton that holds 12 eggs when full.

   a. What percent of the egg carton is full?

   b. What percent of the egg carton is empty?

4. Rewrite each of these sentences using a percent.

   a. The team won 0.85 of its games.

   b. During a sale the price was reduced by $\frac{1}{2}$.

   c. Maria scored 18 out of 25 on a test.

   d. The cost of the book is 2.5 times its price ten years ago.

   e. Dave needed $1\frac{1}{2}$ times the number of bricks that he had to build a wall.

3. a. $\frac{9}{12} = \frac{75}{100}$

   $= 75\%$

   75% of the egg carton is full.

   b. $\frac{3}{12} = \frac{25}{100}$

   $= 25\%$

   25% of the egg carton is empty.

4. a. The team won 85% of its games.

   b. During a sale the price was reduced by 50%.

   c. Maria scored 72% on a test.

   d. The cost of the book is 250% of its price ten years ago.

   e. Dave needed 150% of the number of bricks that he had to build a wall.

5. Express each decimal number as a percent.

   a. 0.35

   b. 0.07

   c. 4.2

   d. 1.62

6. Express each fraction as a percent.

   a. $\frac{23}{100}$

   b. $\frac{3}{10}$

   c. $\frac{4}{5}$

   d. $2\frac{3}{20}$

   e. $1\frac{7}{25}$

5. a. 0.35 = 35%

   b. 0.07 = 7%

   c. 4.2 = 420%

   d. 1.62 = 162%

6. a. $\frac{23}{100}$ = 23%

   b. $\frac{3}{10}$ = 30%

   c. $\frac{4}{5}$ = 80%

   d. $2\frac{3}{20} = \frac{43}{20}$

      = 215%

   e. $1\frac{7}{25} = \frac{32}{25}$

      = 128%

7. Express each percent as a decimal number and as a fraction in lowest terms.

   a. 45%

   b. 9%

   c. 200%

   d. 160%

7. a. 45% = 0.45 and $\frac{9}{20}$

   b. 9% = 0.09 and $\frac{9}{10}$

   c. 200% = 2

   d. 160% = 1.60 and $1\frac{3}{5}$

8. Estimate the answer for each of the following.

   a. 40% of 102

   b. 22% of 10

   c. 66% of 300

   d. 125% of 400

8. a. 40

   b. 2.2

   c. 200

   d. 500

Answers will vary from those shown, but should be within range.

9. Calculate the answer for each of the following.

   a. 48% of 2000

   b. 22% of 10

   c. 66% of 300

   d. 130% of 500

9. a. 960

   b. 2.2

   c. 198

   d. 650

10. A store is holding a 25% off sale. What is the sale price of a sweater that regularly sells for $45.98?

10. The sale price is $11.50.

11. In Alberta a goods and services tax of 7% is added to the price of clothing. What is the final price of a pair of jeans that sells for $39.99?

11. $42.79 is the final price.

Guiding the Student

Help the students to decide what to do next. It is recommended that students review the notes in the sections which correspond to the questions in the pretest with which the students experienced success, and that the students do a few sample questions from the activities.

It is recommended that students carefully study the notes in the sections which correspond to questions in the pretest with which the students experienced difficulty, and that the students do most of the questions in the activities.

Question	Skill	Section
1a., b., 3	writing percents less than 100	14
1 c.	writing percents greater than 100	14
4 a., b., 5 a., b.	writing a decimal fraction less than 1 as a percent	12
4 c., d., e., 5 c., d.	writing a decimal fraction greater than 1 as a percent	13
6 a., b., c.	expressing a fraction less than 1 as a percent	12
6 d., e.	expressing a mixed number as a percent	13
7 a., b.	expressing a percent less than 100 as a fraction and a decimal	12
7 c., d.	expressing a percent greater than 100 as a fraction and a decimal	13
8	estimating a percent of a number	15
9	calcualting a percent of a number	15
10, 11	applying percents	16

PERCENTS LESS THAN 100%

What Lies Ahead

In this section the student will learn these skills.

- interpreting percents less than 100%
- expressing a percent as a decimal number and as a fraction
- expressing a fraction or a decimal number as a percent

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

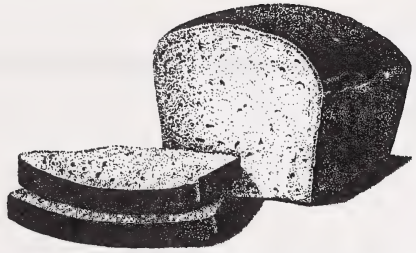
- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students check their answers to the answers in this section and correct any errors.

Practice Activities

1. A loaf of bread is 76% whole wheat. Express the percent of whole wheat flour in this loaf of bread as each of the following.

   a. a fraction in lowest terms

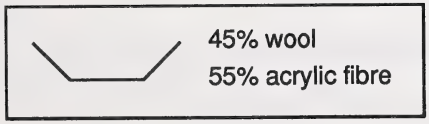
   b. a decimal number



2. The label on a sweater shows that the sweater is made of wool and acrylic fibre. Express each part as the following.

   a. a fraction in lowest terms

   b. a decimal number



Suggested Answers

1. a. $\frac{76}{100} = \frac{19}{25}$

   b. 0.76

2. a. wool $\frac{45}{100} = \frac{9}{20}$

   acrylic $\frac{55}{100} = \frac{11}{20}$

   b. wool 0.45

   acrylic 0.55

3. Coffee cream is 18% milk fat. Express the percent of milk fat as each of the following.

   a. a fraction in lowest terms

   b. a decimal number

3. a. $\frac{18}{100} = \frac{9}{50}$

   b. 0.18

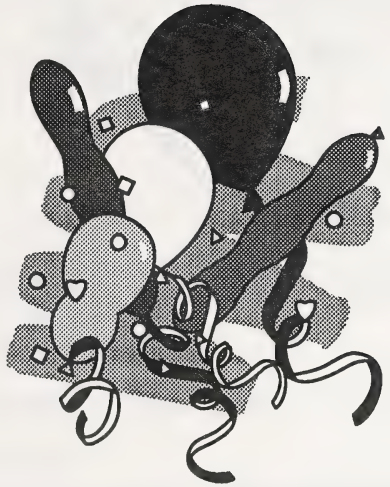
4. The number of red balloons in a package is 40% of the number of yellow balloons. Express the percent as each of the following.

   a. a fraction in lowest terms

   b. a decimal number

4. a. $\frac{40}{100} = \frac{2}{5}$

   b. 0.40



5. A metal alloy is made of zinc, tin, and lead. The amount of tin is 60% of the amount of lead. Express this percent as each of the following.

   a. a fraction in lowest terms

   b. a decimal number

5. a. $\frac{60}{100} = \frac{3}{5}$

   b. 0.60

Practice Activities

1. About $\frac{3}{4}$ of the students in the computer class were present. Express the fraction as each of the following.

   a. a percent

   b. a decimal number

2. The baseball player hit safely 0.25 of the times he was up to bat. Express the decimal number as each of the following.

   a. a percent

   b. a fraction

Suggested Answers

1. a. $\frac{3}{4} = 75\%$

   b. $\frac{3}{4} = 0.75$

2. a. $0.25 = 25\%$

   b. $0.25 = \frac{1}{4}$

3. The amount of fence Bruce painted is $\frac{1}{5}$ of the amount Joan painted. Express this fraction as each of the following.

   a. a percent

   b. a decimal number

4. Jake's age is 0.3 of his father's age. Express the decimal number as each of the following.

   a. a percent

   b. a fraction

3. a. $\frac{1}{5} = 20\%$

   b. 0.20

4. a. $0.3 = 30\%$

   b. $0.3 = \frac{3}{10}$

5. Complete this table. Make sure that you give the fractions in lowest terms.

5.

	Fraction	Decimal Number	Percent
a.	$\frac{1}{100}$	0.01	1%
b.	$\frac{1}{50}$	0.02	2%
c.	$\frac{1}{10}$	0.1	10%
d.	$\frac{7}{20}$	0.35	35%
e.	$\frac{1}{5}$	0.20	20%
f.	$\frac{2}{5}$	0.4	40%
g.	$\frac{1}{2}$	0.5	50%
h.	$\frac{3}{5}$	0.6	60%

Concluding Activities

1. Write >, <, or = in each ▒ . Use mental computation only.

   a. 100% ▒ 1

   b. 25% ▒ 2.5

   c. 50% ▒ $\frac{1}{5}$

   d. 60% ▒ 0.06

   e. 75% ▒ $\frac{2}{3}$

   f. 10% ▒ 10

   g. 4% ▒ 0.4

   h. 1% ▒ 1

Suggested Answers

1. a. =

   b. <

   c. >

   d. >

   e. >

   f. <

   g. <

   h. <

2. You can use patterns to find the percent that is equivalent to a fraction.

Example

	Fraction	Percent	
$+\frac{1}{2}$ {	$\frac{1}{2}$	50%	} + 50%
	$\frac{1}{2}$	100%	

Complete the following charts mentally by using patterns.

a.

Fraction	Percent
$\frac{1}{4}$	25%
$\frac{2}{4}$	
$\frac{3}{4}$	

Fraction	Percent
$\frac{1}{4}$	25%
$\frac{2}{4}$	50%
$\frac{3}{4}$	75%

b.

Fraction	Percent
$\frac{1}{5}$	20%
$\frac{2}{5}$	
$\frac{3}{5}$	
$\frac{4}{5}$	

c.

Fraction	Percent
$\frac{1}{25}$	4%
$\frac{2}{25}$	
$\frac{3}{25}$	
$\frac{4}{25}$	
$\frac{5}{25}$	
$\frac{6}{25}$	
$\frac{7}{25}$	

b.

Fraction	Percent
$\frac{1}{5}$	20%
$\frac{2}{5}$	40%
$\frac{3}{5}$	60%
$\frac{4}{5}$	80%

c.

Fraction	Percent
$\frac{1}{25}$	4%
$\frac{2}{25}$	8%
$\frac{3}{25}$	12%
$\frac{4}{25}$	16%
$\frac{5}{25}$	20%
$\frac{6}{25}$	24%
$\frac{7}{25}$	28%

PERCENTS GREATER THAN 100%

What Lies Ahead

In this section the student will learn these skills.

- interpreting percents greater than 100%
- expressing a percent as a decimal number and as a fraction
- expressing a fraction or decimal number as a percent

Gathering Materials

For this section the student will need these items.

Mathematics 8

Module 5

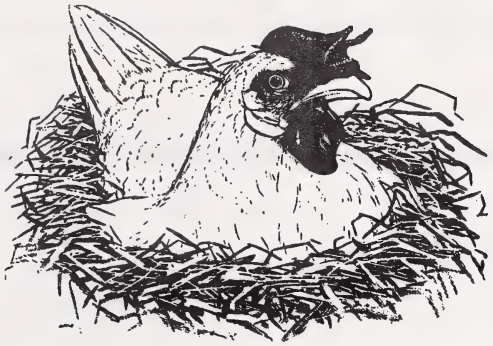
Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section and help the student decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. This year the hens laid 300% of the eggs they laid last year. Express the percent as a whole number.



2. Joan repaid her mother 110% of the money she borrowed.

   a. Express the percent as a fraction.

   b. Express the percent as a decimal number.

Suggested Answers

1. 300% = 3

2. a. $1\frac{1}{10}$

   b. 1.1

3. Becky is 125% of the height she was two years ago.

   a. Express the percent as a fraction.

   b. Express the percent as a decimal number.

3. a. $1\frac{1}{4}$

   b. 1.25

Practice Activities

1. a. A supersonic jet can fly at 2.2 times the speed of sound. Express this as a percent.

   b. A rocket can fly at $5\frac{3}{4}$ times the speed of sound. Express this as a percent.

2. a. A nail is $2\frac{1}{2}$ times the length of a paper clip. Express this as a percent.

   b. A pencil is 1.6 times the length of a nail. Express this as a percent.

Suggested Answers

1. a. 220%

   b. 575%

2. a. 250%

   b. 160%

3. The diameter of the wire to make coat hangers is $7\frac{1}{2}$ times the diameter of a human hair. Express this as a percent.

3. 750%

4. Milk is 1.56 times the mass of gasoline. Express this as a percent.

4. 156%

Concluding Activities

1. An ostrich's egg is 1 000 000 times the mass of a hummingbird's egg. Express this as a percent.

2. The volume of steam is 167 000% of the volume of water. Express this as a whole number.

3. An ant can lift a mass that is 5000% of the mass of its own body. Express this as a whole number.

Suggested Answers

1. 100 000 000%

2. 1670

3. 50

PROPORTION AND PERCENT

What Lies Ahead

In this section the student will learn to use this skill.

- using proportions to solve problems of this form: what percent is a of b?

Gathering Materials

For this section the student needs these items.

Mathematics 8

Module 5

Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. 2 out of 25 light-bulbs tested by the Bright Light Company failed. Express this as a percent.

2. There are 23 boys and 20 girls on the bus. Express this ratio as a percent. Use a statement.

Suggested Answers

1. $\frac{2}{25} = 8\%$

2. $\frac{23}{20} = 115\%$

3. Janice received these marks on five tests.

Language Arts	19 out of 25
Mathematics	42 out of 50
Science	9 out of 10
Social Studies	16 out of 20
French	82 out of 100

a. Express each mark as a percent.

b. Rank the test results from the highest percent to the lowest percent.

3. a. $\frac{19}{25} = 76\%$

$\frac{42}{50} = 84\%$

$\frac{9}{10} = 90\%$

$\frac{16}{20} = 80\%$

$\frac{82}{100} = 82\%$

b. The test results are ranked from highest percent to lowest percent.

9 out of 10 (90%)

42 out of 50 (84%)

82 out of 100 (82%)

16 out of 20 (80%)

19 out of 25 (76%)

Practice Activities

1. Kerry has 200 customers on a paper route. 36 of the customers are away on holidays. What percent of the customers are away?

2. Howie got 36 questions correct on a 45-question test. What percent did he get correct?

3. John earns $30 000 a year. He spends $9000 on taxes. What percent of his salary does he spend on taxes?

Suggested Answers

1. $\frac{36}{200} = \frac{18}{100}$

   $= 18\%$

2. $\frac{36}{45} = 80\%$

3. $\frac{9000}{30\,000} = 30\%$

Concluding Activities

1. Bronze is made of 9 parts copper and 1 part tin.

   a. What percent of the bronze is tin?

   b. What percent of the bronze is copper?

   c. The number of parts of copper is what percent of the number of parts of tin?

2. a. A punch has cranberry juice, lemonade, and ginger ale in the ratio of 1 : 3 : 2. What percent of the punch is lemonade?

   b. Cranberry juice is what percent of the ginger ale in the punch?

Suggested Answers

1. a. $\frac{1}{10} = 10\%$

   b. $\frac{9}{10} = 90\%$

   c. $\frac{9}{1} = 900\%$

2. a. $\frac{3}{6} = 50\%$

   b. $\frac{1}{6} = 17\%$

FINDING A PERCENT OF A NUMBER

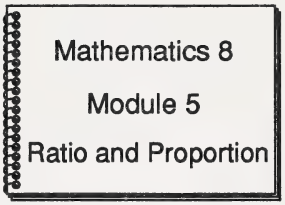
What Lies Ahead

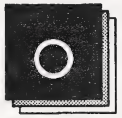
In this section the student will learn these skills.

- estimating a percent of a number
- finding a percent of a number using paper and pencil methods or a calculator
- calculating a percent of a number using mental computation

Gathering Materials

For this section the student needs these items.





"Making Sense of Percents" on Disk B of *MAC 6*.

Guiding the Student

- Emphasize to the students the goal of this section and help the students decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

For Questions 1 to 5, circle the best estimate.

1. 98% of 680
   a. 0.68
   b. 6.8
   c. 68
   d. 680

2. 26% of 399
   a. 1
   b. 10
   c. 100
   d. 1000

3. 33% of 180
   a. 0.6
   b. 6
   c. 60
   d. 600

4. 49% of 105
   a. 0.5
   b. 5
   c. 50
   d. 500

5. 22% of 450
   a. 0.9
   b. 9
   c. 90
   d. 900

Suggested Answers

1. 680
2. 100
3. 60
4. 50
5. 90

6. Estimate an answer for each of the following.

   a. 98% of 60

   b. 11% of 750

   c. 22% of 50

   d. 20% of 189

   e. 50% of 59

   f. 82% of 605

6. Answers will vary, but should be close to those shown.

   a. 57

   b. 80

   c. 44

   d. 40

   e. 30

   f. 495

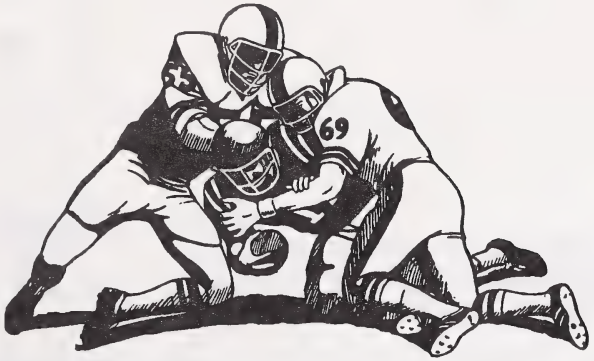
Computer Alternative

7. Do the program "Making Sense of Percents" on Disk B of *MAC 6*. Read the instructions in the folder with the disk before using the program.

7. Computer corrected

Practice Activities

1. The seating capacity of a football stadium is 10 800. At one game 75% of the seats were occupied. How many people were at the football game?



2. About 80% of the nuts in a can of mixed nuts are peanuts. In a handful of 20 nuts, how many peanuts are there?

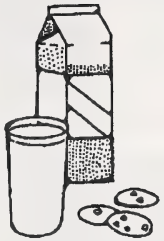
Suggested Answers

1. 8100 people were at the football game.

2. 16 nuts are peanuts.

3. Find the amount of milk fat contained in 1000 mL of each type of dairy product in the chart below.

	Type	Milk Fat
a.	whipping cream	35%
b.	coffee cream	18%
c.	cereal cream	9%
d.	partly-skimmed milk	2%



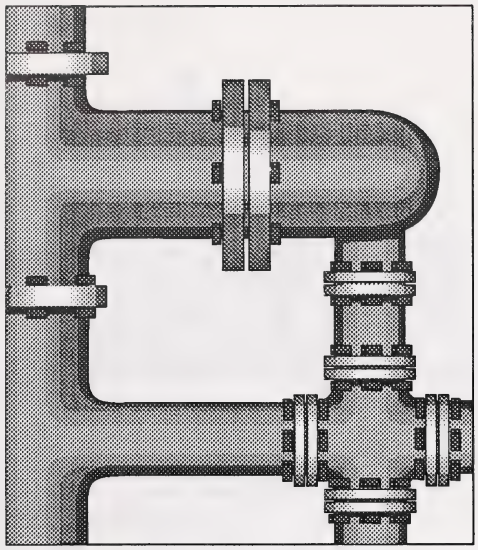
3. a. 350 mL

b. 180 mL

c. 90 mL

d. 20 mL

4. Martinez uses solder to fix his pipes. Solder is a mixture of tin and lead. In hard solder, 65% of the total mass is tin. Find the amount of lead and tin in a 5-kg bar of hard solder.



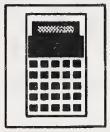
4. There are 1.75 g of lead.

   There are 3.25 g of tin.

Concluding Activities

1. Complete each of the following mentally.
   a. 25% of 16
   b. 50% of 16
   c. 75% of 16
   d. 10% of 90
   e. 20% of 90
   f. 30% of 90

2. Compute each of the following using a calculator.



   a. 18% of 50
   b. 50% of 18
   c. 88% of 25
   d. 25% of 88

3. What pattern did you notice in Question 2?

4. Apply the pattern you discovered in Question 3 to compute each of the following mentally.
   a. 26% of 50
   b. 84% of 25
   c. 55% of 20

Suggested Answers

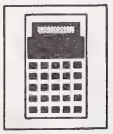
1. a. 4
   b. 8
   c. 12
   d. 9
   e. 18
   f. 27

2. a. 9
   b. 9
   c. 22
   d. 22

3. 18% of 50% = 50% of 18,
   88% of 25 = 25% of 88.
   So, a% of b = b% of a.

4. a. 13 — 50% of 26
   b. 21 — 25% of 84
   c. 11 — 20% of 55

5. Compute each of the following using a calculator.



a. 45% of 60

b. 20% of 60 + 25% of 60

c. 60% of 42

d. 50% of 42 + 10% of 42

e. 19% of 24

f. 20% of 24 – 1% of 24

6. What pattern did you notice in Question 5?

7. Apply the pattern you discovered in Question 6 to compute each of the following mentally.

a. 35% of 80

b. 31% of 60

c. 79% of 50

d. 11% of 40

5. a. 27

b. 27

c. 25.2

d. 25.2

e. 4.56

f. 4.56

6. 45% = 20% + 25%

45% of 60 = 20% of 60 + 25% of 60

60% = 50% + 10%

60% of 42 = 50% of 42 + 10% of 42

19% = 20% – 1%

19% of 24 = 20% of 24 – 1% of 24

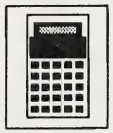
7. a. 28 35% = 30% + 5%

b. 18.6 31% = 30% + 1%

c. 39.5 79% = 80% – 1%

d. 4.4 11% = 10% + 1%

8. Compute each of the following using a calculator.



a. 25% of 48
b. 50% of 24
c. 15% of 70
d. 30% of 35
e. 90% of 50
f. 45% of 100

9. What pattern did you discover in Question 8?

10. Apply the pattern you discovered in Question 8 to calculate each of the following mentally.
    a. 15% of 32
    b. 50% of 36
    c. 22% of 50
    d. 36% of 200

8. a. 12
   b. 12
   c. 10.5
   d. 10.5
   e. 45
   f. 45

9. 25% of 48 = 50% of 24

   15% of 70 = 30% of 35

   90% of 50 = 45% of 100

   Doubling and halving took place.

10. a. 4.8
    b. 18
    c. 11
    d. 72

APPLICATION OF PERCENT

What Lies Ahead

In this section the student will learn this skill.

- finding percent increases and decreases

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 5
Ratio and Proportion

Guiding the Student

- Emphasize to the students the goal of this section and help the student decide what to do.
- Help the students check their answers to the activities in this section and correct any errors.

Practice Exercises

1. What discount is given on each of the following items?

   a. A CD player regularly costs $159.99. It is on sale at a discount of 18%.

   b. A 10-speed bicycle is on sale at a discount of 25%. It regularly costs $250.

   c. Hockey gloves that regularly cost $39 are on sale at a discount of 40%.

2. Calculate the sale price for each of the following items.

   a. A TV that regularly costs $950 is on sale at a discount of 25%.

   b. A microwave oven that regularly costs $249.99 is on sale at a discount of 20% off.

3. What is GST and sales tax for each of the following items?

   a. A skateboard costs $89.99 in British Columbia.

   b. A watch costs $17.50 in Saskatchewan.

   c. Running shoes cost $49.95 in Nova Scotia.

Suggested Answers

1. a. $28.80

   b. $62.50

   c. $15.60

2. a. $712.50

   b. $199.99

3. a. $101.69

   b. $19.95

   c. $58.79

Extra Practice

1. A department store is offering a 30% discount on regularly priced items. Find the sale price of each of these items.

   a. a coat that is regularly priced at $35

   b. shoes that are regularly priced at $89.99

   c. a dress that is regularly priced at $150

   d. a suit that is regularly priced at $249.95

2. A car is priced at $18 500 in Alberta and the GST is 7%. What is the final cost of the car?

3. A sweater sells for $39 in Manitoba, the GST is 7%, and the sales tax is 7%. What is the final cost?

Suggested Answers

1. a. $24.50

   b. $62.99

   c. $105

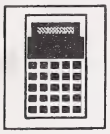
   d. $174.97

2. $19 795

3. $44.46

Concluding Activities

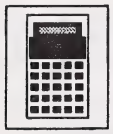
1. A sporting goods store is having a 20% off sale. Calculate the final cost of each of the following items. Use your calculator.



   a. a basketball that is regularly priced at $39.99

   b. a hockey stick that regularly costs $28.98

2. If the GST is 7%, find the final cost of each purchase in Alberta. Use your calculator.



   a. jeans that cost $55

   b. boots that cost $89.99

   c. a 10-speed bicycle that costs $259

   d. a tape that costs $12.98

Suggested Answers

1. a. $47.99

   b. $37.94

2. a. $58.85

   b. $96.29

   c. $277.13

   d. $13.89

SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Sections 11 to 16.

Gathering Materials

For this section the student nees these items.

Mathematics 8
Module 5
Ratio and Proportion

Solve It: The Meaning of Percent

(optional)

Guiding the Student

- Emphasize to the students the goal of this section is to review Part Three.
- Help the students check their answers to the pretest and correct any errors. (See Section 11 for answers).

MODULE CONCLUSION

What Lies Ahead

In this section the student will complete the Module Assignment.

Gathering Materials

For this section the student needs these items.

Mathematics 8
Module 5
Ratio and Proportion

Assignment Booklet

Guiding the Student

- Emphasize to the students that the assignment should be done independently.
- Give the students feedback to the assignment.

Suggested Answers to Assignment Booklet

Part 1: Multiple-Choice Questions

20

Each of the following questions has four suggested answers, one of which is better than the others. Indicate the best choice by writing the letter in the appropriate blank on the response page at the right.

1. A bag of marbles contains 8 red marbles, 4 green marbles, and 7 blue marbles. What is the ratio of the number of blue marbles to the total number of marbles?

   A. 7 : 19
   B. 19 : 7
   C. 7 : 12
   D. 12 : 7

2. What is the ratio of the number of circles to the number of triangles in the following diagram?

   △△△ □□□□ ○○○○○

   A. $\frac{3}{5}$
   B. $\frac{5}{3}$
   C. $\frac{2}{3}$
   D. $\frac{1}{4}$

3. Which ratio of the number of general admission tickets to the number of reserved tickets is 7 to 5?

   A. 14 general admission tickets for every 10 reserved tickets
   B. 8 general admission tickets for every 6 reserved tickets
   C. 20 general admission tickets for every 28 reserved tickets
   D. 15 general admission tickets for every 11 reserved tickets

Part 1 Response Page

1. A

2. B

3. A

Part 1 (continued)

4. Which rate of the cost of ice cream to the quantity of ice cream is $1.96/L.

   A. 1.5 L for $2.70
   B. 2 L for $3.38
   C. 2.5 L for $5.05
   D. 3 L for $5.88

5. Manny sold 5 lemon pies for every 2 cherry pies. What percent of the cherry pie sales were the lemon pie sales?

   A. 400%
   B. 25%
   C. 250%
   D. 40%

6. A shirt regularly priced at $40 is on sale for 30% off. What percent of the regular price is the sale price?

   A. 12%
   B. 10%
   C. 70%
   D. 88%

7. A computer printer types 7200 characters in 8 minutes. What is the rate in 1 minute?

   A. 900 characters in 1 minute
   B. 2700 characters in 1 minute
   C. 4500 characters in 1 minute
   D. 5400 characters in 1 minute

Part 1 Response Page (continued)

4. D

5. C

6. C

7. C

Part 1 (continued)

8. Jennifer has read 54% of her book. If the book has 250 pages, how many does she have left to read?

   A. 135
   B. 196
   C. 142
   D. 115

9. Rob and Brad raced in the 50 m dash. Rob's time was 12.5 s, but Brad's time was 8% less. What was Brad's time?

   A. 4.5 s
   B. 11.5 s
   C. 7 s
   D. 13.5 s

10. Asham and Juan have the same total number of tapes and CDs. The ratio of Asham's tapes to CDs is 12 : 1. The ratio of Juan's tapes to CD is 1 : 12. If Asham has 5 CDs how many CDs does Juan have?

    A. 5
    B. 11
    C. 60
    D. 65

Part 1 Response Page (continued)

8. D

9. B

10. C

Total for Part 1 = _____ (Maximum possible: 20 marks)

Part 2: Short-Answer Questions

57

12

Give the complete answers in the spaces provided on the response page at right.

1. Can 12 marbles be arranged in two groups so that the ratio of the number of marbles in the first group to the number of marbles in the second group is each of the following? Answer **yes** or **no**.

   a. 1 to 1

   b. 1 to 2

   c. 1 to 3

   d. 1 to 4

   e. 1 to 5

   f. 2 to 3

6

2. Make a diagram to illustrate each of the ratios you answered yes to in Question 1.

Page 2 Response Page

1. a. yes

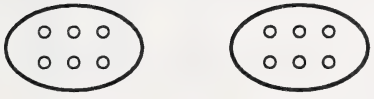
   b. yes

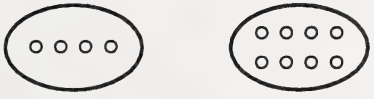
   c. yes

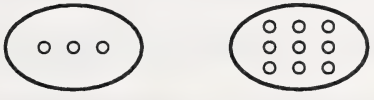
   d. no

   e. yes

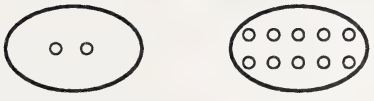
   f. no

2. a. 

   b. 

   c. 

   d. no possible diagram

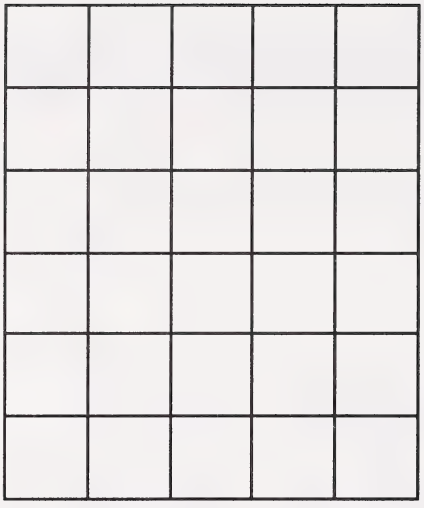
   e. 

   f. no possible diagram

Part 2 (continued)

2

3. Shade 40 % of this diagram.



6

4. Are the following statements reasonable? Why or why not?

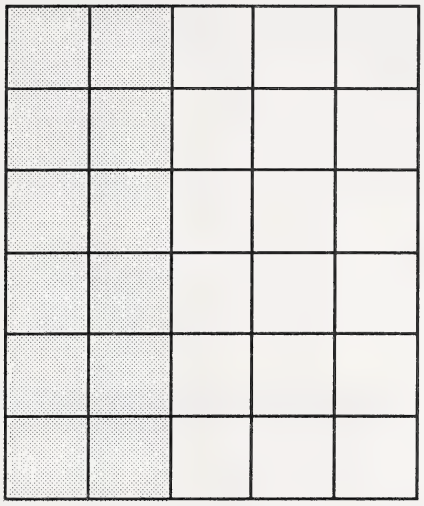
   a. There is a Canadian born every second.

   b. The circumference of the sum is about 10 000% of the circumference of the earth.

   c. The ratio of the mass of a man's brain to the total mass of the man is about 3 : 7.

Part 2 Response Page (continued)

3.



4. a. No, if there was a Canadian born every second, there would be 31 536 000 births every year. There were only 392 661 births in 1989.[1]

   b. Yes, the circumference of the sun is 100 times the circumference of the earth.

   c. No, a 70-kg adult would have a brain with a mass of 30 kg if this ratio was true. This is not reasonable.

[1] Statistics Canada.

Part 2 (continued)

8

5. Express each of these ratios as a percent.

   a. 21 : 20

   b. 4 : 5

   c. 1.3 : 2.5

   d. $1\frac{3}{4}$: 5

6

6. Express each percent as a fraction and as a decimal.

   a. 80%

   b. 450%

   c. 6%

3

7. A 20 L jug of mineral water costs $17.80. Calculate the cost of 1 L of this water.

3

8. Determine which is the best buy, 350 mL of pop for 99¢ or 1.5 L of the same pop for $4.50.

Part 2 Response Page (continued)

5. a. 105%

   b. 80%

   c. 52%

   d. 35%

6. a. 0.8 or $\frac{4}{5}$

   b. 4.5 or $\frac{9}{2}$

   c. 0.06 or $\frac{3}{50}$

7. The cost of 1 L of this water is $0.89.

8. The 350 mL pop is the best buy.

Part 2 (continued)

4 9. A tree in the school yard casts a shadow 5 metres long. At the same time, a 3 metre post casts a shadow 1.5 metres long. How tall is the tree?

3 10. Rory purchased a ski jacket valued at $350. The sales tax in the province is 9%. What is the total price he paid for the jacket?

4 11. A popcorn machine is being discounted on the annual sale at 20%. If the regular price of the machine is $49.99, what will you pay during the sale?

Part 2 Response Page (continued)

9. The tree is 10 m high.

10. The total price is $381.50.

11. The sale price is $39.99.

Total for Part 2 = _____ (Maximum possible: 57 marks)

Part 3: Problems

48

Answer the following problems on the response page at the right. Show all the work and express each answer in a statement.

6

1. Billie has 20 coins in nickels and quarters. The ratio of nickels to quarters is 3 to 1.

   a. How many nickels does she have?

   b. How many quarters does she have?

   c. How much money does she have?

6

2. For the foundation of a house, 300 kg of gravel are mixed with 450 kg of sand, and 100 kg of cement. For each of the following, express the ratio in lowest terms.

   a. What is the ratio of sand to gravel?

   b. What is the ratio of gravel to cement?

   c. What is the ratio of cement to gravel to sand?

Part 3 Response Page

1. a. Billie has 15 nickels.

   b. Billie has 5 quarters.

   c. Billie has $2.

2. a. The ratio of sand to gravel is 3 : 2.

   b. The ratio of gravel to cement is 3 : 1.

   c. The ratio of cement to gravel to sand is 2 : 6 : 9.

Part 3 (continued)

6 3. A shirt regularly priced at $37.50 is on sale for $30. What is the percent of discount?

6 4. A dress regularly priced at $65 went on sale in June at 20% off. In July the dress was reduced another 10%. In August the dress was reduced a final 10%. What was the sale price of the dress in August?

6 5. A brass coin contains copper and zinc in a ratio of 21 : 4. What percent of the coin is copper?

Part 3 Response Page (continued)

3. The percent of discount is 20%.

4. The sale price in August was $42.12.

5. 84% of the coin is copper.

Part 3 (continued)

6 6. A car's gas tank holds 90 L of gas. If the gas tank is one-half full and the rate of consumption is 9 L/100 km, how far can the car drive before it runs out of gas?

6 7. Mario goes on a bicycle trip. He cycles at a steady speed and takes one 45-minute break in 7 hours. If he covers a distance of 125 km, what is his rate of speed?

6 8. Wayman and Gilles are shooting baskets. Wayman successfully makes 5 out of 8 shots. Gilles successfully makes 4 out of 6 shots.

   a. Who has the higher success ratio?

   b. What is the success ratio of Wayman and Gilles together?

Part 3 Response Page (continued)

6. The car can drive 500 km before it runs out of gas.

7. The rate of speed is 20 km/h.

8. a. Gilles has the greater success rate.

   b. The success ratio of Wayman and Gilles together is 9 out of 14 shots.

Total for Part 3 = _____ (Maximum possible: 48 marks)

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